

From Economic Primitives to Econometric Modeling: A Time-Series Study of Population Dynamics

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ABSTRACT

Taiwan has one of the lowest fertility rates in the world and is aging rapidly, which makes it important to understand the socioeconomic factors behind its declining births. To move beyond the familiar observation that economic conditions affect childbearing, this study borrows the cognitive systems framework as an interpretive lens, combining Kahneman's (2011) System 1 and System 2 with the recently proposed System 3 of socially conditioned, norm-driven behavior (Dyachenko et al., 2025). Using monthly data for Taiwan from 2007 to 2024, this study applies a four-step time-series strategy to examine how three channels, namely changes in unemployment, rent, and marriage, are related to year-on-year changes in monthly births. The strategy moves from a contemporaneous baseline model to specifications that successively add month fixed effects, theoretically motivated lags, and Newey-West robust standard errors. In contemporaneous models, none of the three variables is significantly associated with births. Once the explanatory variables are lagged by ten to twelve months, however, all three channels become significant, with unemployment and rent negatively related to subsequent birth growth and marriage positively related to it. These associations remain after accounting for autocorrelation and heteroskedasticity. Read through the lens, this pattern suggests that childbearing is not an impulsive System 1 reaction, but a deliberate System 2 process embedded in a System 3 environment of marriage norms and institutions. By incorporating recent data from the 2020s and examining several socioeconomic channels within a single framework, the study provides updated and exploratory evidence on Taiwan's fertility decline.

INTRODUCTION

1.1 A demographic puzzle that cost alone cannot explain

The world is entering a new demographic era, one increasingly defined by sustained low fertility rather than rapid population growth (Geruso & Spears, 2026). In 2024, the global fertility rate stood at 2.2 births per woman, down from 3.3 in 1990 (United Nations, 2025). This decline is not merely a demographic shift, since it carries profound implications for labor markets, social welfare systems, and the long-term economic development of societies. Taiwan represents an especially important case within this global

change. By the late 2010s, Taiwan, together with China, Japan, Hong Kong, and South Korea, ranked among the regions with the lowest total fertility rates in the world (Cheng, 2020). At the same time, Taiwan has aged rapidly, moving from an aged society to a super-aged society in only seven years, from 2018 to 2025 (National Development Council, 2024). These combined pressures make it necessary to examine the social and economic factors that underlie Taiwan's pronounced fertility decline.

The same tension is visible in Taiwan's public media. Current-affairs programs on the public broadcasters have documented both ends of it. A Chinese Television System (CTS) News Magazine special followed people struggling through the difficulties of assisted reproduction in their attempts to have a child (Chinese Television System [CTS], 2024), while an in-depth report program on the Taiwan Public Television Service traced how private high schools are already closing as student numbers collapse (Public Television Service, 2023). Taken together, these accounts complicate any simple story of unwillingness. Some people in Taiwan want children and cannot easily have them, and at the same time the institutions built for children are already shrinking.

For me, this issue is directly visible in everyday life. As a Taiwanese student, I have noticed that young children seem less present in everyday public spaces such as parks. The same pattern struck me during my volunteer work at Zhu-An Elementary School in Yilan, where total enrollment was fewer than one hundred students. This experience helped me further confirm that low fertility is not only an abstract demographic indicator because it is already reshaping schools, neighborhoods, and the daily life of local communities.

At the same time, the issue presents a puzzle. The most common explanations for Taiwan's low fertility are largely Western in origin and centered on cost, including expensive childcare, career penalties for women, and high housing prices. In this tradition, Gary Becker's economics of the family frames the decision to have a child as a rational comparison of costs and benefits (Becker, 1981). Taiwan, however, exposes a crack in that view. Even as the government expands cash subsidies and childcare support, fertility keeps falling. If the problem were only cost, then more money should move the outcome, yet it largely does not. This pattern suggests that something beyond direct cost is also at work, which motivates the present study to look more carefully at uncertainty and at the social meaning attached to family formation in Taiwan.

1.2 Economic and sociocultural explanations of low fertility

Existing research has examined declining fertility from both macroeconomic and microeconomic perspectives. From a macroeconomic perspective, prior work has analyzed how fertility relates to broad economic conditions, including unemployment, recessions and inflation, and broader labor market conditions (Borzoiepour et al., 2024; Currie & Schwandt, 2014), as well as monetary policy (Cumming & Dettling, 2024). From a microeconomic and micro-demographic perspective, fertility can also be understood as a household-level choice shaped by costs, constraints, and preferences. For example, rising wages for women may raise the opportunity cost of the time devoted to childrearing, while the marginal value of an additional child may fall as family size grows (Arroyo & Zhang, 1997). Taken together, these studies indicate that fertility decline is driven not by a single factor but by the interaction between

macroeconomic conditions and household decision making.

Beyond economic accounts, a related body of work emphasizes the sociocultural mechanisms behind low fertility. In South Korea, Japan, and parts of Southern Europe, rapid economic development has often outpaced the transformation of social norms, which produces intergenerational and gender-based tensions around work, marriage, and family formation (Goldin, 2025). In East Asia, family norms shaped by Confucian values may further deepen the double burden carried by women, since rising female labor force participation has not been matched by a proportionate sharing of domestic and caregiving work (Cheng, 2020). In Taiwan, scholars have linked ultra-low fertility to persistent gender inequality in household labor (Cheng, 2020; Thomas et al., 2023), as well as to the historical legacy of the family planning policies of the 1960s and the postponement of marriage (Lin & Yang, 2009).

At a broader level, these sociocultural changes echo what the second demographic transition describes (Lesthaeghe, 2010; Van de Kaa, 1987). In advanced societies, shifts in values and identity, including individualism, self-realization, and a loosening of older norms around marriage and the family, are themselves treated as drivers of low fertility. Within Taiwan, this value layer takes a concrete cultural form. A home is often seen not simply as a place to live but as a precondition for adult family life, and an unspoken sequence of first securing a home, then marrying, and then having a child ties housing, marriage, and childbearing into one bundled decision. Under this script, marrying or raising a child without a home of one's own can be read as being unready or irresponsible, which gives the housing outlook unusual weight in family decisions.

1.3 The three-system framework and fertility decisions

The previous section described economic pressures and shifting family norms at the level of society. To connect them to individual choices, this section turns to how fertility decisions are made. Daniel Kahneman distinguishes two thinking systems in *Thinking, Fast and Slow* (Kahneman, 2011). System 1 is fast, automatic, and emotional, while System 2 is slow, deliberate, and logical. Yet these two systems do not seem to fully capture fertility decisions. Giving birth is rarely impulsive, since it is usually planned months or years in advance, so System 1 does not apply well here. Yet System 2 alone may still be insufficient, because fertility decisions involve not only deliberate calculation but also desires for family life, fears of responsibility, and social expectations.

To address this missing dimension, this study draws on System 3, a conceptual extension proposed by Dyachenko et al. (2025). System 3 adds a socially conditioned layer of decision-making rooted in identity, cultural norms, and collective values. While System 2 deliberately evaluates costs and benefits, System 3 captures how individuals judge their choices through internalized expectations. Dyachenko et al. describe this with the image of a social mirror, meaning that people understand themselves partly through culturally and historically formed standards of approval, responsibility, and appropriate behavior. System 3 therefore adds a social layer to System 2's rational thinking process.

The idea behind System 3 also has an older root in economic anthropology. Karl Polanyi (1944) argued that economic life is embedded in social institutions: people do not make economic decisions as isolated calculators, but within networks of kinship, custom, and shared expectations about how life should

proceed. In this sense, System 3 can be read as a present-day restatement of Polanyi's insight at the level of individual decision-making.

This framework is useful for understanding fertility because the decision to have a child is simultaneously calculated and socially situated. A prospective parent may assess income, housing costs, and future risks through System 2, and consider whether they match the identity of a responsible parent through System 3. Indeed, in Nordic focus group studies, providing security in the form of economic stability and settled housing is described as a central precondition for parenthood, especially among younger generations (Bodin et al., 2021). System 3 thus adds a dimension that a purely economic account may overlook. Material conditions matter not only because they constrain resources, but also because they shape whether individuals believe they are socially ready to marry and become parents.

As noted in Section 1.2, the commonly understood sequence in Taiwan of first securing a home, then marrying, and finally having a child can be read as one such socially conditioned pathway. The shifts in values and self-definition that van de Kaa (1987) and Lesthaeghe (2010) describe under the second demographic transition are consistent with the same account, since both concern how internalized ideals of family life change over time. In this reading, postponed marriage and childbearing may reflect a perceived inability to satisfy the identity-based expectations attached to responsible parenthood.

This interpretive lens provides the conceptual basis for the three observable channels examined in this study. The following section explains how economic uncertainty, housing cost pressure, and family formation are operationalized through monthly indicators. Because System 3 has not been established as a mechanism in fertility research, it is used here as an interpretive lens rather than as a construct measured directly.

1.4 From a broad framework to observable channels

Taken together, the economic and sociocultural strands sketch a rich picture in which uncertainty about the future and shifting norms around home and family both shape fertility. Many of these deeper forces, however, such as value change, identity, and the subjective sense of an unpredictable future, are difficult to measure directly with monthly data. The present study therefore does not attempt to test the entire framework. Instead, it focuses on the parts of that framework that can be observed and operationalized at a monthly frequency, and it treats the broader forces as motivation rather than as quantities to be estimated.

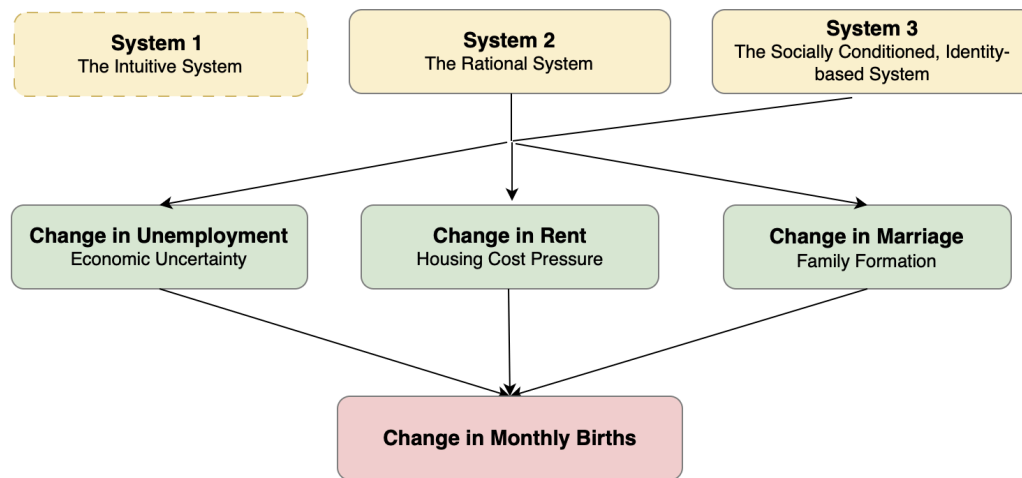


Figure 1. Conceptual framework linking decision systems

Figure 1 translates the theoretical framework borrowed from the existing literature into the empirical design of this study. The yellow boxes represent Kahneman’s System 1 and System 2 and the System 3 proposed by Dyachenko et al. (2025). System 1 is shown with a dashed border because this study does not treat childbearing as an intuitive decision, as discussed in Section 1.3. Instead, it focuses on System 2 and System 3 and links each of the three observable channels examined in this study (represented by the green boxes) back to the framework. First, it uses the year-on-year change in the unemployment rate as a proxy for economic uncertainty. A worsening unemployment rate may be assessed through System 2 as a signal of future employment and income risk, consistent with Bloom’s (2009) argument that uncertainty can delay difficult-to-reverse commitments; through System 3, it may also weaken an individual’s perceived ability to satisfy the social expectation of being a stable and responsible parent. Second, it uses the year-on-year change in rental prices as an indicator of housing cost pressure. Rising rental prices can be similarly interpreted through System 2 as a budgeting and affordability constraint, while through System 3 they may postpone the culturally valued sequence of securing suitable housing before marriage and parenthood. Third, it uses the year-on-year change in the number of marriages as a proximate signal of family formation. Changes in the number of marriages capture family formation as both a planned transition evaluated through System 2 and a socially organized institution through which childbearing remains structured in Taiwan under System 3. Together, the three channels are tested for their associations with the change in births represented by the red box. Under this reading, each variable is not just a number but a measurable trace of one part of the wider story.

It is important to state clearly what this study does and does not test. The study examines whether each of these three channels is associated with birth outcomes, rather than whether the full sequence of first a home, then marriage, and then a child operates as a causal chain. That bundled path is best understood here as narrative background that helps make sense of marriage and childbearing in Taiwan, and the present design neither demonstrates nor relies on a strict causal link among its stages. The three variables

enter the same regression in parallel, so the analysis does not model housing as a cause of marriage or marriage as a mediator between housing and births. Keeping this boundary explicit allows the introduction to draw on a broad and intuitive account of Taiwanese family life while the empirical work stays focused on a small set of observable relationships.

Looking ahead, Section 2.1 will refer to these three monthly signals as the primitives of the analysis, that is, the simple observable quantities on which the econometric models are then built.

1.5 The research gap

Against this background, a significant gap remains in the literature on Taiwan's fertility decline. Although Taiwan's demographic situation has continued to change in recent years, relatively few quantitative studies have examined the issue using data from the period after 2022. For example, Narayan (2006) uses cointegration and variance decomposition analysis to study the determinants of Taiwan's low fertility, yet that analysis relies on data only up to 2001. As a result, findings based on earlier periods may no longer fully reflect Taiwan's current demographic and socioeconomic conditions.

A second limitation concerns the scope of existing quantitative models. While many qualitative studies discuss a wide range of possible causes of Taiwan's low fertility, including past policies, gender roles, delayed marriage, and changing family values (Lin & Yang, 2009), quantitative studies have tended to focus on more specific mechanisms. For example, Kan and Lee analyze the effect of women's education on fertility, Tzeng and colleagues examine age, period, and cohort patterns among married women, Lin and Chen focus on the business cycle, and Thomas and colleagues test the effect of housework division within couples (Kan & Lee, 2018; Tzeng et al., 2019; Lin & Chen, 2018; Thomas et al., 2023). These studies offer valuable insights, but their different focuses make it difficult to form an integrated explanation of Taiwan's fertility decline. This points to a need for updated quantitative analysis that incorporates more recent data and examines several socioeconomic determinants within one empirical framework.

1.6 Objectives, research question, and contribution

Building on the limitations identified above, this study provides an updated quantitative analysis of Taiwan's fertility decline with three aims. First, it constructs a more recent time-series dataset that incorporates demographic and economic conditions in the 2020s, which addresses the shortage of updated empirical evidence in earlier work. Second, it examines the relationship between fertility outcomes and several potential determinants, namely labor conditions, housing cost, and marriage patterns, rather than concentrating on a single factor. Third, by comparing contemporaneous associations with lagged associations, it asks whether these conditions are reflected in births immediately or instead emerge with a time lag. In addition, given features of birth-related data such as autocorrelation, trend behavior, and lagged effects, the study uses a four-step sequential empirical strategy to improve the robustness of the analysis. Overall, the goal is to identify candidate signals associated with fluctuations in Taiwan's monthly births from a set of economic and social indicators, and to provide exploratory evidence that may support future demographic research and family policy discussion.

Based on these objectives, this study asks a focused question. After accounting for seasonal patterns and time-series characteristics, are the three channels of labor market conditions, housing cost, and marriage associated with changes in Taiwan's monthly births, and if so, at what time lags do these associations appear? This phrasing deliberately stays close to what a three-variable, theory-guided model can actually support, rather than asking in the abstract which among many indicators matters most.

To address this question, the study examines three sub-questions. First, are changes in labor market conditions, housing-related cost, and marriage patterns statistically associated with changes in Taiwan's monthly births? Second, do these relationships appear immediately, or do they emerge with a time lag? Third, after accounting for seasonal patterns and time-series characteristics, do any of these variables remain meaningful candidate signals for understanding Taiwan's contemporary fertility decline?

This study contributes to the literature on Taiwan's fertility decline in three main ways. First, it provides updated quantitative evidence by incorporating more recent data from the 2020s, a period in which Taiwan's demographic challenges have continued to intensify. Second, rather than examining only one determinant, it analyzes several social and economic indicators within one empirical framework, which allows a more integrated view of the factors associated with fertility change. Third, by applying a sequential time-series strategy that considers lagged effects, seasonal patterns, and autocorrelation, it offers a more careful and transparent approach to identifying potential signals in birth-rate fluctuations.

Although this study does not claim to establish definitive causal relationships, it helps clarify which variables deserve closer attention in future demographic research, and its findings may inform policy discussion related to population in Taiwan. Because Taiwan's case illustrates the demographic stagnation of a developed society, these implications may also carry over to fertility policy elsewhere. The deeper mechanisms set aside here, including uncertainty and identity, are taken up again as directions for future work in the final section.

METHODOLOGY

This study adopts a quantitative research method. Since the purpose of this study is to examine whether measurable changes in economic and demographic variables are statistically associated with changes in births over time, a quantitative approach is appropriate. Monthly time-series data are used to identify empirical patterns related to Taiwan's fertility decline.

The analysis is exploratory rather than causal. Its purpose is not to prove that any single variable directly causes changes in births, but to examine which selected indicators show stronger statistical associations with birth growth after accounting for seasonality, time lags, and common time-series issues.

2.1 Research Framework and Empirical Strategy

This study adopts a step-by-step time-series empirical strategy. Since birth outcomes may reflect not only current socioeconomic conditions (Goldin, 2025), but also decisions, constraints, and demographic

processes from earlier periods (Arroyo & Zhang, 1997), a contemporaneous regression may not fully capture the temporal structure of fertility-related behavior. Therefore, the empirical framework begins with a contemporaneous OLS regression and then gradually introduces additional features that better reflect the characteristics of monthly birth data.

Before the strategy is described step by step, the word primitives in this framing deserves a brief explanation, because it summarizes how the variables were chosen. In economic modeling, primitives are the elementary building blocks that a model takes as given, the simple and foundational quantities on which everything else is built. The term has recently regained currency.

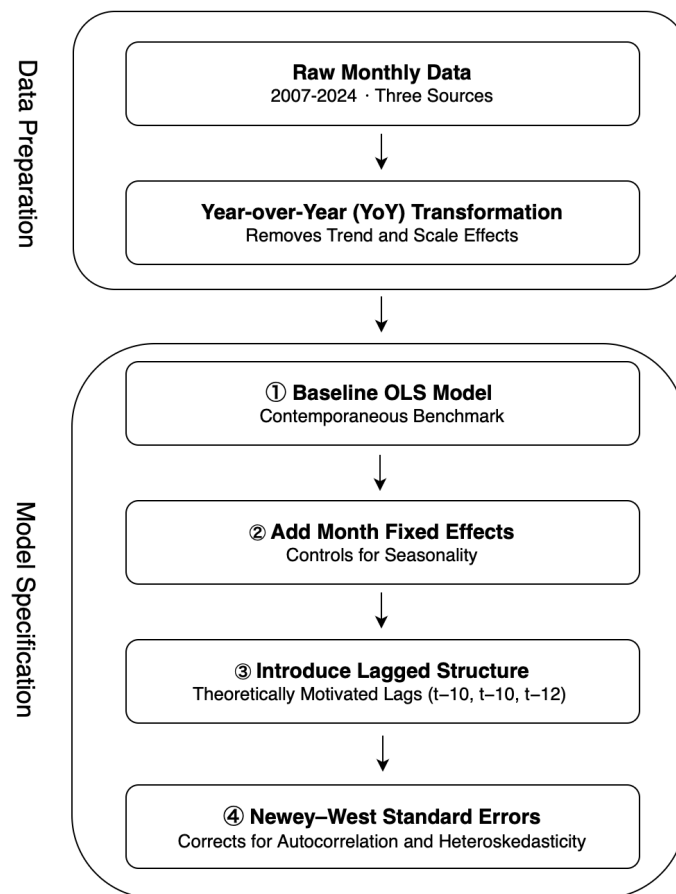


Figure 2. The four-step empirical strategy

This renewed use of the term is partly associated with AI-native research, in which economic activity can be examined through fine-grained records of human–AI interactions rather than only through aggregate economic indicators. Drawing on anonymized Claude conversations and API transcripts, Anthropic first constructs simple task-level measures—such as complexity, skill requirements, autonomy, and success—before using them to investigate broader occupational and macroeconomic outcomes.

Anthropic (2026), for example, uses economic primitives to mean simple, foundational measures that are tracked first, before more elaborate analysis is layered on top of them. This study follows the same spirit, while applying it to a different empirical setting. Unemployment change, rental inflation, and marriage growth are treated as the primitives of the fertility decision, that is, simple, monthly, observable signals that stand closest to the decision itself, and the econometric machinery of the following sections is then built on top of them. This ordering, from economic primitives to econometric modeling, is what the four-step strategy implements.

The empirical strategy contains four steps. First, a contemporaneous OLS regression is estimated using the year-on-year change in unemployment, rent CPI growth, and marriage growth. Second, month fixed effects are added to the contemporaneous regression to account for residual month-of-year patterns. Third, a theory-based lagged regression is estimated, in which unemployment change and rent CPI growth are lagged by 10 months and marriage growth is lagged by 12 months. Finally, Newey–West HAC standard errors are applied to the lagged regression as a robustness check. Figure 2 summarizes the four-step empirical strategy.

2.2 Data Collection and Sample Construction

This study draws on monthly macroeconomic and demographic data for Taiwan from the Taiwan Economic Journal Macroeconomic Database, the Department of Household Registration, Ministry of the Interior, and the Directorate-General of Budget, Accounting and Statistics. The raw series span the period from January 2000 to December 2025. However, because some variables were incomplete for 2025, the estimation sample was intentionally restricted to end in December 2024 to ensure complete and consistent data across all variables.

An important strength of Taiwan’s demographic data is the historical and institutional continuity of its household-registration system. Taiwan inherited a highly developed household-registration system established during the Japanese colonial period, and population registration continued to play an important role in public administration after World War II. During the period of U.S. aid and Taiwan’s early economic development, population control and family planning also became national development priorities, partly because rapid population growth was viewed as potentially offsetting the economic benefits of major public investments, including infrastructure projects such as the Shimen Reservoir. This long institutional development has produced administrative demographic records with near-universal population coverage. Compared with survey-based data, such records are therefore subject to little sampling error and relatively limited underreporting, providing a highly reliable basis for examining long-term changes in births and marriages.

For the regression analysis, this study selects four core variables, including the number of births, the unemployment rate, the CPI rent index, and the number of marriages. These variables serve as observable proxies for the main dimensions examined in this study: fertility outcomes, economic uncertainty, rent-based housing cost pressure, and family formation. However, these aggregate indicators do not fully capture the broader concepts they are intended to represent. The unemployment rate reflects overall

labor-market conditions but does not fully capture economic pressures particularly relevant to younger adults, such as persistently low wages or nonstandard and unstable employment. Similarly, the CPI rent index generally changes more gradually than house prices and therefore may underestimate the housing pressure associated with purchasing a home. Finally, the number of registered marriages captures formal family formation but does not fully reflect the growing roles of nonmarital cohabitation or the postponement of marriage. These measurement gaps should therefore be considered when interpreting the empirical results.

Because the starting and ending dates of the data series differ across sources, the regression sample is restricted to the period in which the required variables are jointly available. After data integration and year-on-year transformations, the common sample covers January 2007 to December 2024, with 216 monthly observations. After accounting for the lagged variables used in the main regression, the final estimation sample covers January 2008 through December 2024, yielding 204 monthly observations.

2.3 Data Processing and Variable Construction

The monthly series are transformed into year-on-year growth rates or year-on-year differences. Comparing each month with the same month in the previous year helps reduce the influence of recurring seasonal patterns and focuses the analysis on changes over time rather than differences in the levels of the series.

For births, the CPI rent index, and marriages, the year-on-year growth rate is calculated as:

$$YoY_t = 100 \times \left(\frac{X_t}{X_{t-12}} - 1 \right)$$

where X_t denotes the value of the relevant variable in month t . For the unemployment rate, which is already measured as a percentage, the year-on-year change is expressed in percentage points:

$$UnemploymentDiff_t = UnemploymentRate_t - UnemploymentRate_{t-12}$$

The dependent variable, $BirthYoY_t$, is the year-on-year percentage change in the number of births. It measures whether the number of births in a given month has increased or decreased relative to the same month in the previous year, rather than measuring the level of monthly births.

The first explanatory variable, $UnemploymentDiff_t$, is the year-on-year change in the unemployment rate, measured in percentage points. It is used as an observable proxy for changes in economic insecurity. An increase in unemployment may indicate weaker labor market conditions and greater uncertainty regarding future household income.

The second explanatory variable, $RentCPIYoY_t$, is the year-on-year growth rate of the CPI rent index. It is used as a proxy for rent-based housing cost pressure. Although the CPI rent index does not capture broader housing affordability conditions, such as house prices or mortgage burdens, it provides a monthly

measure of changes in rental costs.

The third explanatory variable, $MarriageYoY_t$, is the year-on-year growth rate in the number of marriages. In the Taiwanese context, marriage remains closely related to family formation and childbearing. The variable is therefore used as a proximate indicator of changes in the number of couples entering formal family formation.

2.4 Contemporaneous Regression

The first regression examines the contemporaneous relationship between birth growth and the three explanatory variables using ordinary least squares:

$$BirthYoY_t = \beta_0 + \beta_1 UnemploymentDiff_t + \beta_2 RentCPIYoY_t + \beta_3 MarriageYoY_t + \varepsilon_t$$

In this equation, $BirthYoY_t$ denotes the year-on-year growth rate of births in month t . $UnemploymentDiff_t$, $RentCPIYoY_t$, and $MarriageYoY_t$ denote the year-on-year unemployment change, rent CPI growth, and marriage growth observed in the same month. The error term, ε_t , captures other factors affecting birth growth that are not included in the model.

This contemporaneous regression serves as the reference point for subsequent regressions. It provides an initial assessment of whether changes in unemployment, rental costs, and marriages observed in the same month are associated with birth growth. However, the absence of a contemporaneous association would not necessarily imply that these variables are unrelated to births. Because recorded births reflect fertility and family-formation decisions made in earlier months, the relationship may emerge only after an appropriate lag is introduced. The contemporaneous regression therefore provides a comparison point for the regression with month fixed effects and the theory-based lagged regression.

2.5 Regression with Month Fixed Effects

The second regression adds month fixed effects to the contemporaneous regression. Although the year-on-year transformations already reduce recurring seasonal variation, month fixed effects are included to account for any remaining month-of-year patterns in birth growth and the explanatory variables. This additional control helps reduce the risk that residual seasonal variation is attributed to unemployment, rent CPI growth, or marriage growth. The model can be written as:

$$BirthYoY_t = \beta_0 + \beta_1 UnemploymentDiff_t + \beta_2 RentCPIYoY_t + \beta_3 MarriageYoY_t + \sum_{m=2}^{12} \gamma_m Month_m + \varepsilon_t$$

January is used as the reference month, so the model includes dummy variables from February to December. Each month dummy equals 1 if the observation belongs to that month and 0 otherwise. Adding

these variables allows the model to separate month-specific patterns from the estimated relationships between the main explanatory variables and birth growth.

2.6 Theory-Based Lagged Regression

The third regression introduces theory-based lags for the explanatory variables. This adjustment is based on the timing of fertility decisions. Births recorded in a given month reflect fertility decisions and socioeconomic conditions from earlier periods. Therefore, regressions using only same-month explanatory variables may fail to capture the delayed temporal structure of fertility behavior. In the lagged regression, unemployment change and rent CPI growth are lagged by 10 months, while marriage growth is lagged by 12 months:

$$\begin{aligned} BirthYoY_t = & \beta_0 + \beta_1 UnemploymentDiff_{t-10} + \beta_2 RentCPIYoY_{t-10} \\ & + \beta_3 MarriageYoY_{t-12} + \sum_{m=2}^{12} \gamma_m Month_m + \varepsilon_t \end{aligned}$$

Since human pregnancy typically lasts approximately 38–40 weeks, or around nine to ten months, socioeconomic conditions around the time of conception may appear in birth records about ten months later. The 10-month lags for unemployment change and rent CPI growth are therefore intended to align economic conditions observed around the likely period of conception with the birth outcomes that follow. Economic insecurity and housing cost pressure may affect decisions about childbearing, but the effect would only appear in birth records later.

The twelve-month lag for marriage growth reflects the possibility that changes in marriage patterns may influence births with a longer delay. Unlike unemployment and housing conditions, which may affect the decision around conception more directly, marriage may precede conception and involve an additional period of fertility planning. A 12-month interval therefore allows approximately one year for family-formation decisions following marriage to develop into observed birth outcomes. It also spans a complete annual cycle in the monthly data, complementing the month fixed effects used to account for recurring seasonal patterns.

This lag structure should not be interpreted as proving an exact causal timeline. Instead, it is a theoretically motivated way to better align the timing of socioeconomic conditions with later birth outcomes. The selected lags represent plausible biological and behavioral timing rather than an assumption that every household follows the same schedule. The purpose is to test whether past economic and social conditions are more closely associated with current birth growth than same-month conditions.

Because the model uses lagged variables, the effective sample begins later than the original dataset. Observations from the first 12 months cannot be included in the lagged regression because the necessary lagged values are not available for all variables.

2.7 Lag Sensitivity Analysis

To examine whether the findings depend on the lag structure selected in Section 2.6, a sensitivity analysis is conducted using all possible lag combinations from 8 to 14 months for the three explanatory variables. A total of 343 models are estimated. Each model includes the same month fixed effects described in Section 2.5 and Newey-West standard errors described in Section 2.8.

Because longer lags reduce the number of observations available at the beginning of the sample, all models are estimated using the same sample period beginning in March 2008. This starting point is based on the longest lag considered in the analysis, which is 14 months. Using a common sample ensures that the AIC and BIC values can be compared consistently across the different models.

The sensitivity analysis examines whether the signs of the three coefficients remain stable under different lag choices, how often each coefficient is statistically significant, and whether the model with the lowest AIC and BIC produces results that are consistent with the main model.

2.8 Newey–West Standard Error Correction

The final step applies Newey–West heteroskedasticity- and autocorrelation-consistent (HAC) standard errors to the lagged regression rather than estimating a separate regression. The coefficient estimates therefore remain identical to those from the lagged regression, while the standard errors are adjusted for potential autocorrelation and heteroskedasticity. A maximum lag of 12 is used to allow for possible dependence over an annual cycle in the monthly data.

Monthly time-series data may contain autocorrelation, meaning that the error term in one month may be related to errors in previous months. The data may also contain heteroskedasticity, meaning that the variance of the error terms may change over time. Both features are common concerns in time-series analysis and can affect statistical inference even when the OLS coefficient estimates themselves remain unchanged. If conventional OLS standard errors are used in the presence of autocorrelation or heteroskedasticity, the estimated standard errors may be biased, which can in turn distort t-statistics, confidence intervals, and p-values and lead to misleading conclusions about statistical significance.

Newey–West HAC standard errors are designed to provide inference that is robust to both heteroskedasticity and serial correlation within the specified lag window. Their use is therefore particularly appropriate here because the study relies on monthly observations over time and evaluates the statistical significance of lagged relationships. In this study, Newey-West standard errors are used as a robustness check to examine whether the main findings remain stable after accounting for these common time-series concerns. If the coefficients remain statistically significant after the correction, this provides greater confidence that the reported significance is not simply an artifact of underestimated conventional standard errors.

RESULTS & DISCUSSION

This chapter presents the results and discussion of empirical analysis. Before reporting the regression estimates, it first examines the basic distribution of each variable to give an overall sense of the data. This step helps clarify the scale and the degree of variation of each variable, and helps identify any extreme values worth noting, which provides a basis for interpreting the regression results that follow. After this, the chapter follows the four-step strategy set out in Chapter 2 and reports the four regression models in turn, observing how the explanatory power of the models and the significance of the variables change as the specification is adjusted step by step.

Table 1. Descriptive Statistics

Variable	Mean	SD	Min	Max
Panel A. Level variables				
Births (persons)	15,280.92	2,802.60	9,442	23,398
Unemployment rate (%)	4.06	0.61	3.31	6.13
CPI rent index (2021=100)	96.33	4.37	91.41	107.66
Marriages (couples)	11,440.67	3,307.86	3,999	22,064
Panel B. Transformed variables				
Birth growth, YoY (%)	-1.37	13.72	-31.85	43.71
Unemployment change, YoY (pp)	-0.03	0.54	-1.19	2.01
CPI rent growth, YoY (%)	0.86	0.67	-0.46	2.67
Marriage growth, YoY (%)	2.12	25.47	-45.89	149.97

Notes. The sample covers monthly data for Taiwan from January 2007 to December 2024, giving 216 observations for each variable. Because the lagged regressions require twelve months of prior observations, their effective sample is reduced to 204 observations (January 2008 to December 2024). Panel A reports the original level variables, and Panel B reports the transformed variables used in the regression analysis. Each transformed variable is measured as the year-on-year change, comparing a given month with the same month one year earlier. The birth, rent, and marriage variables are expressed as year-on-year percentage growth, while the unemployment variable is expressed as the year-on-year change in percentage points. All variables are measured in their original units rather than in logarithms. SD denotes the sample standard deviation.

Table 1 reports the descriptive statistics for all variables in two panels. Panel A reports the original level variables and shows the actual scale of each series. Over the sample period, Taiwan recorded on average about 15,000 births per month, an unemployment rate of around 4 percent, and roughly 11,000 marriages per month. Panel B reports the transformed variables that actually enter the regression analysis, namely the year-on-year growth rate or year-on-year change of each variable, and these are the core variables that the study uses to explain movements in births.

Among these variables, three features stand out. First, the mean of birth growth is negative (−1.37 percent), which indicates that births in Taiwan followed a contracting trend over the sample period rather than only fluctuating up and down in the short run, and this is the central phenomenon that the study addresses. Second, the marriage variable is far more volatile than the others, with a standard deviation as

high as 25.47 and a range that runs from -45.89 percent to 149.97 percent, an unusually wide spread. This largely reflects the fact that marriage registration in Taiwan is sensitive to the choice of auspicious dates and to beliefs about favorable and unfavorable years in the lunar calendar, since years regarded as unsuitable for marriage can noticeably reduce the number of registrations and therefore produce extreme swings in year-on-year growth. This feature also serves as a reminder that the estimates for the marriage variable should be interpreted with particular care. Third, by contrast, the year-on-year change in the unemployment rate is stable, with a mean close to zero (-0.03 percentage points) and small variation, which suggests that Taiwan's labor market was generally stable over this period and did not experience sharp shocks.

The discussion above describes the basic distribution of each variable. On this basis, the analysis now turns to the regressions. It begins with the simplest contemporaneous baseline model, which includes only the current-period values of the three core variables and serves as a benchmark for the later models. It then gradually adds monthly seasonal controls and a theoretically motivated lag structure to clarify whether movements in Taiwan's births are associated with contemporaneous socioeconomic conditions or instead with conditions from earlier periods.

3.1 Contemporaneous Models with and without Seasonality Controls

Regression 1 first estimates a contemporaneous baseline model without month fixed effects or lagged terms. As shown in column (1) of Table 2, the coefficients of the three core variables are generally in the expected directions, but none of them reaches statistical significance. The overall explanatory power of the model is also very limited, with an R^2 of only 0.018, and the F-test is not statistically significant.

Table 2. Regression Results

Variable	(1) Baseline	(2) + Month FE	(3) + Lags	(4) Newey-West
Unemployment change	-2.007 (1.842)	-1.998 (1.892)	-10.252*** (1.740)	-10.252** (3.630)
Rent CPI growth	-1.784 (1.445)	-1.778 (1.485)	-4.974** (1.652)	-4.974* (2.255)
Marriage growth	0.040 (0.038)	0.041 (0.039)	0.085* (0.036)	0.085** (0.027)
Month FE	No	Yes	Yes	Yes
Lag structure	None	None	10, 10, 12	10, 10, 12
SE type	OLS	OLS	OLS	Newey-West
N	216	216	204	204
R^2	0.018	0.020	0.203	0.203
Adjusted R^2	0.004	-0.049	0.144	0.144

Variable	(1) Baseline	(2) + Month FE	(3) + Lags	(4) Newey-West
AIC	1747.3	1769.0	1637.2	1637.2

Notes. The dependent variable is birth growth (BirthYoY, in percent). Standard errors are reported in parentheses. Columns (1) and (2) are contemporaneous models, while in columns (3) and (4) the explanatory variables are entered with theoretically motivated lags, with unemployment change and rent CPI growth lagged by 10 months and marriage growth lagged by 12 months. Columns (3) and (4) come from the same regression, so the point estimates, R^2 , and AIC are identical, and column (4) only replaces the standard errors with Newey-West (HAC) standard errors using a maximum lag of 12 to address autocorrelation and heteroskedasticity. Month fixed effects use January as the reference month. Columns (1) and (2) cover January 2007 to December 2024 ($N = 216$), and columns (3) and (4) cover January 2008 to December 2024 ($N = 204$) owing to the lag structure. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Regression 2 further adds month fixed effects to control for possible monthly seasonality in births and marriage registrations. However, after adding month fixed effects, the model does not improve clearly. The three core variables remain statistically insignificant, and the adjusted R^2 falls to -0.049. This suggests that, after using year-on-year growth rates or year-on-year changes, simply controlling for monthly seasonality is not enough to explain changes in Taiwan's birth growth rate.

The results of these two contemporaneous models point to an important conclusion. Changes in Taiwan's births are unlikely to be directly explained by unemployment, rent inflation, or marriage growth in the same month. This is consistent with the time structure of fertility decisions, because birth registrations usually reflect earlier conception and family formation decisions rather than an immediate response to current macroeconomic conditions.

3.2 Theory-Based Lag Model

Regression 3 adds a mixed lag structure based on theoretical timing. The year-on-year change in the unemployment rate and the year-on-year growth rate of the CPI rent index are lagged by 10 months, reflecting the roughly ten-month interval from conception to birth, while the year-on-year growth rate of marriages is lagged by 12 months, allowing for the year or longer that typically separates marriage from a first birth.

As column (3) of Table 2 shows, this change markedly improves the fit of the model, with R^2 rising from 0.018 to 0.203. More importantly, the contrast between the two contemporaneous models, where no variable is significant, and this lagged model is itself a key finding, since it indicates that births in Taiwan are associated with earlier conditions rather than with conditions in the same month.

In Regression 3, all three core variables have the expected signs and are statistically significant. The clearest case is unemployment, whose ten-month lag carries a coefficient of -10.252, so that a one-percentage-point increase in the year-on-year change in unemployment is associated with a 10.252-percentage-point decrease in year-on-year birth growth approximately ten months later. The lagged rent variable is also negative, indicating that higher rent inflation is associated with a later decline in birth growth, while the lagged marriage variable is positive, indicating that stronger marriage growth is associated with higher birth growth roughly a year later. The magnitude of the unemployment coefficient

is large, however, and should be read as a statistical association that may partly reflect specific fluctuations in the sample period rather than as a direct causal effect of that size.

Because these lagged variables enter the model together, it is also important to check that they are not too closely correlated with one another. As reported in Table 3, the pairwise correlations among the three lagged regressors are low, with the largest absolute value being 0.299, and all variance inflation factors are close to one. This indicates that the explanatory variables are sufficiently independent, so the lagged results above are unlikely to be distorted by multicollinearity.

Table 3. Correlation Matrix and VIF for the Explanatory Variables

Variable	(1)	(2)	(3)	VIF
(1) Unemployment change (t–10)	1.000			1.13
(2) Rent CPI growth (t–10)	-0.299	1.000		1.10
(3) Marriage growth (t–12)	-0.165	0.024	1.000	1.03

Notes. Entries are Pearson correlation coefficients, with only the lower triangle reported and the diagonal equal to one. The variables are the lagged regressors used in the main regressions in columns (3) and (4) of Table 2, namely unemployment change and rent CPI growth at t–10 and marriage growth at t–12, aligned to a common sample of 204 observations (January 2008 to December 2024). The largest absolute correlation is 0.299, well below the conventional threshold of 0.7. VIF denotes the variance inflation factor for each variable, computed without month fixed effects. All VIF values are close to one and far below 5, which indicates no concern about multicollinearity.

3.3 Lag Sensitivity Analysis

The lag structure described in Section 3.2 was selected based on the expected timing between economic conditions, marriage, and births. To examine whether the results are sensitive to the choice of lags, the model was re-estimated using all possible combinations of lags from 8 to 14 months for the three explanatory variables. This produced 343 different models. Each model includes month fixed effects and Newey and West HAC standard errors with a maximum lag of twelve months. The same sample period from March 2008 to December 2024 was used for all models, with 202 observations, so that the AIC and BIC values could be compared consistently.

The results are summarized in Table 4. The signs of all three coefficients remain unchanged across the 343 models. Changes in unemployment and rent CPI growth are negative in every model, while marriage growth is positive in every model. Unemployment change is statistically significant at the 5% level in 94.8% of the models, compared with 62.7% for marriage growth and 53.6% for rent CPI growth. These results suggest that the relationship between unemployment and births is the most stable. The statistical significance of rent CPI growth is more affected by the choice of lag, although the direction of the relationship remains negative. Similar results are also found among the 27 models using lags within one month of those used in the main model.

Table 4. Robustness of Results to Alternative Lag Structures

Dependent variable: year-on-year birth growth (BirthYoY, %)

Variable	(1) Main model 10/10/12	(2) Best fit 11/8/13	(3) All lags -1 9/9/11	(4) All lags +1 11/11/13	(5) Main model, extended sample 10/10/12
Unemployment change (Δ Unemp)	-10.206** (3.708)	-11.300*** (3.262)	-9.925* (3.874)	-10.772** (3.411)	-10.490** (3.545)
Rent CPI growth (RentYoY)	-4.790* (2.292)	-5.559** (2.148)	-4.480 (2.445)	-5.273* (2.102)	-5.683** (1.892)
Marriage growth (MarriageYoY)	0.086** (0.027)	0.147*** (0.031)	0.049 (0.038)	0.150*** (0.032)	0.083** (0.028)
Month fixed effects	Yes	Yes	Yes	Yes	Yes
Lag structure (months)	10, 10, 12	11, 8, 13	9, 9, 11	11, 11, 13	10, 10, 12
Standard errors	NW (12)	NW (12)	NW (12)	NW (12)	NW (12)
Sample period	2008:03–202 4:12	2008:03–2024 :12	2008:03–202 4:12	2008:03–202 4:12	2008:03–2025:0 8
Observations (N)	202	202	202	202	210
Adjusted R ²	0.144	0.243	0.106	0.237	0.167
AIC	1621.1	1596.2	1629.9	1598.0	1682.0
BIC	1670.7	1645.9	1679.5	1647.6	1732.2

Notes: Newey-West (HAC, maxlags = 12) standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All specifications include month fixed effects (January as base). Lag structures are listed in the order unemployment/rent/marriage, in months.

Column (2) is the specification that minimizes both AIC and BIC among all 343 lag combinations (8 to 14 months per variable). Across all 343 specifications, the signs of the three coefficients are identical to those shown here, so the direction of the results does not depend on the lag choice.

Columns (1) through (4) are estimated on a common sample so that AIC and BIC are directly comparable. Column (5) extends the sample through August 2025 as a further check; its AIC and BIC are not comparable to those of columns (1) through (4). Coefficients in column (1) differ slightly from those in Table 2 because the common sample begins in March 2008 to accommodate the longest candidate lag of 14 months.

Sources: Ministry of the Interior, Department of Household Registration; Directorate-General of Budget, Accounting and Statistics; author's calculations.

The model with the lowest AIC and BIC uses lags of 11 months for unemployment, 8 months for rent CPI growth, and 13 months for marriage growth, as shown in column 2 of Table 4. The directions and

statistical significance of the coefficients are similar to those of the main model, while the adjusted R^2 increases from 0.144 to 0.243. The improvement is mainly related to changing the marriage lag from 12 to 13 months. This result is reasonable because there may be a period between marriage and conception, followed by approximately nine to ten months of pregnancy.

Overall, the sensitivity analysis shows that the main findings do not depend strongly on one specific choice of lags. Since the 10, 10, and 12 month lag structure was selected based on the expected timing of these relationships, it is retained as the main model. The model with the lowest AIC and BIC is reported in Table 4 for comparison. The results also remain similar when the sample is extended to August 2025, as shown in column 5 of Table 4.

3.4 Newey-West Corrected Estimates

Because monthly time-series data may have residual autocorrelation and heteroskedasticity, Regression 4 applies Newey-West standard errors based on Regression 3. This correction does not change the coefficient estimates themselves. Instead, it corrects the standard errors and the assessment of statistical significance. The main table uses a maximum lag of 12 in order to cover possible annual autocorrelation patterns in monthly data.

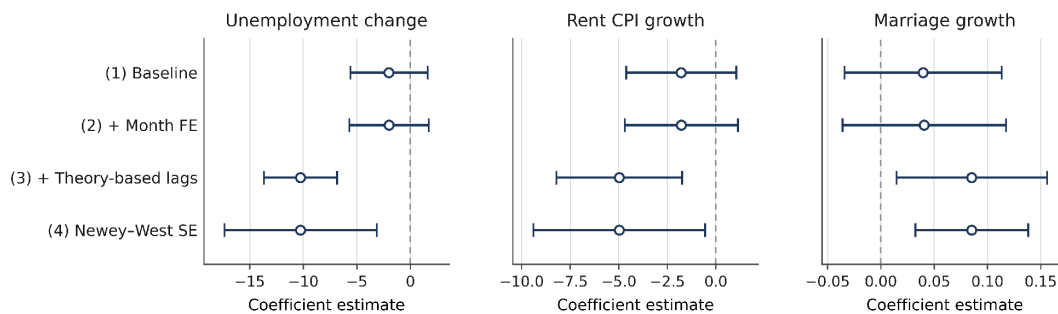


Figure 3. Coefficient estimates across regression specifications

As shown in column (4) of Table 2, all three core variables remain statistically significant after the standard errors are corrected with the Newey-West method. Because this step leaves the coefficient estimates unchanged and only adjusts the standard errors, the relevant comparison is in significance rather than magnitude, and each of the three variables retains a p-value within conventional levels.

Figure 3 summarizes the coefficient estimates across the four regression specifications. The contemporaneous estimates in Models 1 and 2 are not statistically distinguishable from zero, whereas the theory-based lag specification in Model 3 produces significant negative coefficients for unemployment change and rent CPI growth and a significant positive coefficient for marriage growth. These associations remain statistically significant after applying Newey–West HAC standard errors in Model 4. Because the variables differ substantially in scale, coefficient magnitudes should be compared across specifications

within each panel rather than visually across panels. Overall, the Newey–West correction confirms that the main findings are robust to potential autocorrelation and heteroskedasticity in the monthly data.

3.5 Interpretation of the Three Channels

Taken together, the results indicate that Taiwan's birth growth is more closely associated with socioeconomic conditions and family formation observed in earlier periods than with conditions in the same month. The following discussion interprets these findings through the economic insecurity, housing cost, and family formation channels.

First, the economic insecurity channel receives preliminary support. The 10-month lag of the year-on-year change in the unemployment rate is significantly and negatively associated with the year-on-year growth rate of births. This indicates that when labor market conditions worsen and families face greater income uncertainty, later birth growth tends to be lower. This pattern fits the view set out in the introduction, namely that uncertainty itself, and not only bad news, can lead people to postpone commitments that are hard to reverse. The change in the unemployment rate can be read here as an observable proxy for economic uncertainty, so the negative association is consistent with the result that greater uncertainty encourages households to postpone childbearing. This evidence is indirect, however, since unemployment is a proxy rather than a direct measure of uncertainty.

Second, the housing cost channel also receives preliminary support. However, because the main model uses the year-on-year growth rate of the CPI rent index, this channel should be more precisely interpreted as “rent-based housing cost pressure,” rather than a complete measure of home purchase affordability or housing price effects. The results show that higher rent inflation is significantly associated with lower birth growth about 10 months later. This suggests that housing costs may affect the timing of childbirth or fertility decisions by reducing young families' expected living and childrearing resources.

Third, the family formation channel is supported. The 12-month lag of the year-on-year growth rate of marriages is significantly and positively associated with the year-on-year growth rate of births. In the context of Taiwan, where most births still occur within marriage, marriage growth is best understood as a proximate indicator of family formation rather than as an independent driver of births. Marriage and childbearing are shaped by many of the same underlying forces, such as economic conditions and changing values, and some couples marry precisely because they intend to have children, so part of this association reflects shared causes rather than an effect of marriage as such. With this caveat in mind, the result still suggests that Taiwan's low fertility is related not only to married couples having fewer children, but also to a decline in the number of people entering marriage and forming families in earlier periods.

These three channels, however, are not the only possible explanations for Taiwan's low fertility. A recent alternative explanation proposed by Fang and Liu (2026) emphasizes educational competition in East Asian societies. They argue that the Confucian emphasis on education and status can suppress fertility when parents face strong incentives to concentrate substantial resources on a smaller number of children. Under this interpretation, the perceived cost of having children includes not only housing and current consumption but also the time, money, and effort required to provide intensive education and maintain

children's future social position. This mechanism is broadly relevant to Taiwan, but Taiwan's institutional context also differs from the highly selective educational pathway underlying a simple examination-competition account. Following the rapid expansion of higher education since the 1990s, university admission in Taiwan has become nearly universal. As a result, educational pressure may operate less through the narrow question of whether a child can enter university and more through positional competition over which university, educational opportunities, and eventual social position the child can attain. The pressure may therefore have shifted from threshold competition to competition for relative status, reinforcing concerns over elite-school access, intergenerational status transmission, and the rising demands of intensive parenting. Such pressures could independently discourage childbearing and may coexist with the economic and family-formation channels examined in this study.

Broader macroeconomic events and policy changes during the sample period provide another set of alternative explanations. Major shocks, such as the COVID-19 pandemic, may have affected employment conditions, housing markets, marriage registrations, and fertility decisions simultaneously, creating short-run relationships that cannot be attributed entirely to any one channel in the model. Changes in cash subsidies, childcare support, or other pro-natalist policies may likewise have influenced fertility behavior during particular periods and potentially offset or reinforce the relationships observed here. Because these external events are not modeled separately, the estimated coefficients may partly capture their common effects. The three channels should therefore be interpreted as statistically associated signals rather than exhaustive explanations of Taiwan's fertility decline.

3.6 Limitations

Several limitations should be considered when interpreting the results. First, although the study carefully develops and refines the empirical models through a sequential strategy—including year-on-year transformations, month fixed effects, theoretically motivated lags, multicollinearity diagnostics, and Newey–West HAC standard errors—the estimates remain associational rather than causal. These steps were used to align the models as closely as possible with the timing and statistical characteristics of monthly birth data, but they cannot eliminate omitted-variable bias or establish that changes in unemployment, rent, or marriage directly cause changes in births.

Second, year-on-year growth in monthly births is not equivalent to an individual-level fertility rate. Changes in monthly births may partly reflect shifts in the size and age composition of the reproductive-age population, which are not directly controlled for in the present models. Third, the explanatory variables are imperfect proxies. Changes in unemployment do not directly measure perceived uncertainty, CPI rent growth does not capture the full burden of housing affordability, and marriage growth does not directly measure family intentions, identity, or socially conditioned behavior. Finally, although the selected lag lengths are theoretically motivated by the timing of conception, birth, and family formation, alternative lag structures or structural changes during events such as the COVID-19 pandemic may produce different estimates. The findings should therefore be interpreted as carefully developed exploratory evidence rather than definitive estimates of the mechanisms underlying Taiwan's fertility

decline.

CONCLUSION

Using monthly data for Taiwan from 2007 to 2024 and a four-step sequential strategy, this study examines how three channels, namely unemployment, rent, and marriage, relate to year-on-year changes in monthly births. The findings reveal a clear pattern. The contemporaneous models, including the version that controls for monthly seasonality, have limited explanatory power, and none of the three variables is significant. Once theory-based lags are added, with unemployment and rent lagged by ten months and marriage lagged by twelve months, all three channels become significant and the fit of the model improves clearly, and the results remain significant after Newey-West robust standard errors are applied.

The significance of this pattern lies not in the magnitude of any single coefficient, but in what it reveals about the time structure of births in Taiwan. Recorded births are more strongly associated with socioeconomic conditions observed around the likely time of conception than with conditions observed in the month of birth. This echoes a basic view that childbearing is a long-term commitment that takes time to mature, so that births today reflect past circumstances more than the present state of the economy. It also serves as a reminder that, in understanding and responding to Taiwan's fertility decline, attention should be paid to socioeconomic conditions from earlier periods rather than only to current figures.

The interpretive lens introduced in Section 1.3 offers one way to read this pattern as a whole. The absence of any contemporaneous association suggests that childbearing is not a System 1 response that reacts on impulse to the news of the month, while the ten-to-twelve-month lags are consistent with a System 2 process in which households deliberate over signals about work, income, and housing before committing to a decision that is hard to reverse. The positive marriage association can be interpreted through a System 3 lens, because marriage remains an important social and institutional context for childbearing in Taiwan. Births outside marriage have stayed at roughly four percent of all births for more than a decade, far below the shares above forty percent common in European Union countries (Center for Survey Research, Academia Sinica, 2022), and the Assisted Reproduction Act has limited assisted reproduction to legally married couples since 2007, although proposals to widen access are under discussion (Hou & Chung, 2025).

The same layer is also reproduced culturally, as a generation raised on intensive cram schooling passes on a demanding and costly script of what raising a child properly requires, a standard captured in NVIDIA founder Jensen Huang's remark that Asian parents tend to express love through criticism (EBC News, 2026). This reading is an analogy rather than a test, but it turns three separate coefficients into a single account of how fertility decisions appear to be made, in which the marriage coefficient partly reflects an institutional gate rather than a purely private preference, and the weight felt by families outside the expected form operates at an emotional and cognitive level rather than a financial one.

4.1 Policy implications

These findings carry several tentative implications for policy discussion. First, because cost pressure, measured here through rent, is negatively associated with later births, cash subsidies alone may not be sufficient, since they do not necessarily address the core concerns that young families hold about housing cost and about the future. Second, the significance of unemployment as a proxy for uncertainty points to a possible role for economic uncertainty in the postponement of childbearing, and if uncertainty does operate in this way, then a stable and predictable policy environment that households can plan around may be as important as direct financial support. Taken together, these points suggest that policy may need to address both cost and uncertainty rather than lowering the price of a single item. These implications remain exploratory and should be treated as directions worth further testing rather than as firm policy prescriptions.

4.2 Future Research

As noted in the introduction, the postponement of childbearing in Taiwan may be connected to economic uncertainty and to the identity-based norms that surround housing and family, yet these forces are hard to measure directly with monthly data, so this study reaches them only through proxies. Future research could measure them more directly. For uncertainty, one could follow the approach of Baker, Bloom, and Davis (2016) and construct an economic policy uncertainty index from Taiwanese newspapers, or even a housing-specific version, and then test it against the birth rate over time. For identity and value change, one could draw on value surveys or cohort analysis, and a recent line of work that extends the cognitive systems framework to behavior shaped by identity and social norms (Dyachenko et al., 2025) offers a hypothesis worth examining rather than a settled conclusion. These extensions, together with the data and method limitations discussed in Section 3.6, form the next steps for this line of research.

Finally, Taiwan's case matters because it embodies the demographic stagnation that a developed society faces once it has matured. While this study cannot offer a definitive account of this phenomenon, it points to a line worth pursuing further, namely that the key to Taiwan's fertility decline may lie not only in how much it costs to raise a child, but in whether the younger generation can see their own future clearly enough to dare to begin one.

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